Shri Guru GobindSinghji Institute of Engineering and Technology, Nanded
S.Y. B. Tech.
Electronics & Tele-Communication Engineering
From Academic Year 2019-20

1. Programme Educational Objectives (PEOs)

PEO I: To study the physics of semiconductor device technology and develop proficiency in computational methods for advanced modeling and simulation (preparation).

PEO II: To study signal and image processing concepts (Core competence) and to design embedded and VLSI systems (Core competence).

PEO III: To study and design digital, analog, and mixed signal VLSI systems (Breadth). Understand the state of art in the recent areas of research in signal and image processing, pattern recognition and computer vision techniques (Breadth).

PEO IV: Provide academic environment aware of excellence, leadership, and ethical codes to students; and teach them lifelong learning skills including research component needed for successful professional career (Learning environment).

2. Program Outcomes (POs)

PO 1 **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2 **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3 **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4 **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the

knowledge of, and need for sustainable development.

PO 8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

PO 10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3. Correlation Matrix (Correlation between the PEOs and the POs)

PO/PSO → PEO ↓	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
I	✓			✓	✓				✓					
II	✓			✓	✓									
III	✓		✓	✓	✓			✓		✓				
IV		✓			✓	✓	✓				✓	✓		

4. Structure of curriculum

Semester I						
Course Code	**Name of the course**	**L**	**T**	**P**	**Credits Th**	**Pr**
BSC271	Mathematics-III: Transform Calculus and Differential Equations	3	--	--	3	--
ESC283	Numerical Methods	3	--	2	3	1
PCC-EC201	Electronic Devices and Circuits	3	1	2	4	1
PCC-EC202	Digital Electronics and Microprocessors	3	--	2	3	1
PCC-EC203	Network Theory	3	1	2	4	1
BSC261	Mathematical Foundation for Engineering*	2	--	--	Audit	
MAC277	Indian Constitution	2	--	--	Audit	
	Total	**19**	**2**	**8**	**21**	
Semester II						
Course Code	**Name of the course**	**L**	**T**	**P**	**Credits Th**	**Pr**
BSC275	Mathematics-IV: Statistical Methods and Complex Analysis	3	--	--	3	--
ESC284	Data Structures	3	--	2	3	1
PCC-EC204	Communication Engineering Principles	3	--	2	3	1
PCC-EC205	Analog Circuits and Design	3	--	2	3	1
PCC-EC206	Microcontrollers and Applications	3	--	2	3	1
HMC278	Human Values and Professional Ethics	2	--	--	2	--
	Total	**17**	--	**8**	**21**	

L – No. of Lecture Hours/week, T – No. of Tutorial Hours/week, P – No. of Practical Hours/week

* This Audit course is only for Direct Second Year students and a MANDATORY course.

5. **Syllabus of course**

Semester - I

BSC271	**Mathematics-III: Transform Calculus and Differential Equations**	**3L:0T:0P**	**3 credits**

Course Objectives:

1. To understand the concepts of Laplace transforms, Fourier Series, Fourier transforms
2. To apply Laplace transforms for solving ordinary differential equations
3. Define and compute the line integral, surface integral, volume integral using Green's Theorem, Stokes's Theorem and the Divergence Theorem.
4. To understand the methods of solving partial differential equations such as wave equation, heat equation and Laplace equation.

Content of course:

Unit 1: Laplace Transforms (10 hours)

Laplace transforms, inverse Laplace transforms, Properties of Laplace transforms, Laplace transforms of unit step function, impulse function, Convolution theorem; Applications of Laplace transforms - solving certain initial value problems.

Unit 2: Fourier Series (07 hours)

Expansion of a function in Fourier series for a given range - Half range sine and cosine expansions.

Unit 3: Fourier Transforms (10 hours)

Fourier Integrals, Fourier transforms-sine, cosine transforms and inverse transforms - simple illustrations

Unit 4: Vector Calculus (10 hours)

Line integrals, surface integrals, Integral Theorems: Greens theorem, the divergence theorem of Gauss and Stokes theorem

Unit 5: Partial Differential Equations (08 hours)

Method of Separation of variables for solving partial differential equations, first and second order one dimensional wave equation, heat equation and two dimensional Laplace equation.

References:

1. Erwin Kreyszig, ***Advanced Engineering Mathematics***, Eighth Edition, John Wiley and Sons, 2015.
2. R. K. Jain and S. R. K. Iyengar, ***Advanced Engineering Mathematics***, Fifth Edition, Narosa Publishing House, 2016.
3. I. N. Sneddon, Elements of Partial Differential Equations, Dover Publications, Inc. Mineola New York.

Course Outcomes:

On successful completion of this course students will be able to

1. Develop the skills of Laplace Transforms, Fourier series and Fourier Transforms and their inverses.
2. Develop the skills of solving Partial differential equations
3. Solve ODE's and PDE's using the properties of Laplace transform, Fourier series and Fourier Transforms.

4. Determine solutions of PDE for vibrating string and heat conduction.
5. Evaluate line integrals, surface integrals, and volume integrals and convert line integrals into area integrals and surface integrals into volume integrals using integral theorems

Articulation Matrix (as below)

PO/PSO➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1	✓			✓				✓				✓		
CO2	✓						✓							
CO3		✓			✓				✓	✓	✓			
CO4						✓			✓					
CO5			✓									✓		

PCC-EC201	Electronic Devices and Circuits	3L:1T:2P	5 credits

Course Objectives

1. To understand operation of semiconductor devices.
2. To understand DC analysis and AC models of semiconductor devices.
3. To apply concepts for the design of Regulators and Amplifiers.
4. To verify the theoretical concepts through laboratory and simulation experiments.
5. To implement mini projects based on concept of electronics circuit concepts.

Content of course

Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors

Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode, Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model, MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell;

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Text /Reference Books:

G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson,2014.
D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley &Sons, 2006.
C.T. Sah, "Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991.
Y. Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford Univ.Press, 2011.

Course Outcomes:

At the end of this course students will demonstrate the ability to

Understand the principles of semiconductor Physics

Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.

Electronic Devices and Circuits Lab

Hands-on experiments related to the course contents of PCC-EC201

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Understand the principles of semiconductor Physics
2. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
3. Understand the current voltage characteristics of semiconductor devices.
4. Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation,
5. Design and analyze of electronic circuits.
6. Evaluate frequency response to understand behavior of Electronics circuits.

Articulation Matrix (as below)

PO/PSO ➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1	✓		✓		✓			✓				✓		
CO2	✓	✓								✓				
CO3		✓					✓		✓					
CO4	✓				✓	✓					✓			
CO5			✓											

PCC-EC202	Digital Electronics and Microprocessors	3L:0T:2P	4 credits

Course Objectives

To acquaint students with

1. Digital codes and Boolean Algebra used in digital design.
2. Real time problem implementation using Boolean functions.
3. Combinational and sequential logic design and basic digital design building block.

Content of course

Digital Codes, Boolean Algebra and Logic Families: BCD codes , binary codes , error detecting and correcting codes, reflective properties of codes, Unit distance codes, Theorems and properties of Boolean algebra, Boolean functions, Canonicals and standard forms, Other logic operations, Digital logic gates, Digital IC logic families, Logic design examples.

Simplification of Boolean Functions: The K-map method: 2, 3, and 4 variable maps, five and six variable maps, Quine McCluskey method of simplification and NAND-NOR realization.

Combinational Logic Design: Adders, Subtractors, Code converters, Binary parallel adders, Decimal adders, Magnitude comparators, Multiplexers, Demultiplexers, Decoders and Encoders, Signed magnitude numbers and their arithmetic implementation.

Sequential Logic Design: Flip-flops: J-K, D, T, SR flip-flops, Excitation tables of flip-flops, Conversion of flip flops, Design of Flip Flops, Applications of Flip Flops.

Counters and Shift Registers: Asynchronous counters, Synchronous counters, mod-3Counters, mod-5 counters, presettable counters, shift-counters, Up-down counters, Ripple counters, Shift registers, Serial in serial out, Serial in parallel out, Parallel in serial out, and Parallel in parallel out shift registers, Introduction to VHDL/Verilog.

Microprocessors: What is Microprocessor? Princeton and Harvard Architecture, Overview of 8085 Microprocessor Architecture, Pin Description of 8085 microprocessor, Survey of 4/8/16/32 bit Microprocessors, Applications of microprocessors.

Semiconductor Memories: Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memories, Read only memories, R/W memories, content addressable memories, CCD memories.

Text/Reference Books:

1. M. Morris Mano, Digital Logic and Computer Design, PHI Publication, New Delhi.
2. William I. Fletcher, An Engineering approach to Digital Design, PHI Publication, New Delhi.
3. Malvino and D. Leach, Digital Principles and Application, Mc Graw Hill Book Company.
4. R. P. Jain, Modern Digital Electronics, McGraw Hill Book Company.
5. Louis Nashelsky, Introduction to Digital Technology, John Wiley & Sons.
6. Williams H. Gothman, Digital Electronics, PHI Publication, New Delhi.

Digital Electronics and Microprocessors Lab

Hands-on experiments related to the course contents PCC-EC202

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Digital codes and their applications, code conversions, Boolean functions implementation and simplification, Logic families.
2. Combinational logic circuits, Implementation of logical functions using MUX, DEMUX, Decoders and encoders.
3. Sequential logic circuits such as flip flops, counters and registers, Design of sequential logic circuits.
4. Implementation of small digital application
5. Microprocessors and semiconductor memories.

Articulation Matrix (as below)

PO/PSO➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1	✓		✓			✓			✓		✓			
CO2	✓											✓		
CO3		✓		✓	✓		✓					✓		
CO4			✓					✓		✓				
CO5	✓			✓					✓					

PCC-EC203	Network Theory	3L:1T:2P	5 credits

Course Objectives

1. To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis techniques.
2. To introduce students with the fundamental concepts in graph theory.
3. To analyze circuits in time and frequency domain.
4. To explain concepts of driving point and transfer functions, poles and zeroes of network functions and their stability.
5. To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.
6. To synthesize the network using passive elements.

Content of course

Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactances, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits. Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation. Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.
Transient behavior, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviors of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Text/Reference Books:

Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000
Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994
A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-Hill Education

Network Theory Lab

Hands-on experiments related to the course contents of PCC-EC-203

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

Articulation Matrix (as below)

PO/PSO ➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1	✓			✓			✓		✓		✓			
CO2		✓						✓						
CO3			✓		✓							✓		
CO4	✓						✓							
CO5		✓							✓					

ESC283	Numerical Methods	3L:0T:2P	4 credits

Course Objectives

1. To Understand Accuracy and precision with examples.
2. To locating roots of the equations using Graphical method, Bisection method and false Position method.
3. Understand one point iterative method to find True roots.
4. To Know the Open method like Newton Rapson's Method, Multiple Roots and Secant method.
5. To find unknowns using Gauss Elimination method, Gauss Jordan method and Gauss Seidel method.

Content of course

Approximations & Errors: Significant figures, accuracy & precision, Error definitions, round off errors, Truncation errors, Error Approximations, Total numerical errors, Blunders formulation errors and Data uncertainty.

Roots of Equation: Bracketing Methods: Graphical methods, Bisections method, false position method Open Methods: Simple one point iteration method, Newton Raphson method, secants method, multiple Roots, System of nonlinear equations.

Case Study: Design of Electric circuit and General Engineering problems.

System of Linear algebraic equations: Gauss eliminations method, pitfalls of elimination, techniques for improving solutions. Gauss Jordan & Guass seidal methods. Matrix inverse, error analysis and system condition and Guass Seidal method.

Curve fitting: Least Squares regression: Linear regression, Polynomial regression, multiple linear regression, nonlinear regression. *Interpolation:* Newtons divided difference-interpolating polynomials, Lagrange interpolation polynomials and Spline Interpolation.

Numerical Differentiation & Integration: Newton cotes integration formula: trapezoidal rule, Simpson's rule, and integration with unequal segments. Integrations of equations: Romberg integration, gauss quadralure integration improper integration. Numerical Differentiation, High accuracy differentiation formula, Richardson extrapolation, Derivative of unequally spaced data, derivative and integral estimates for data with errors.

Case studies: Cash flow analysis, determination of root mean square current by numerical Integration.

Ordinary differential equations: One step method: Euler's method, modification & improvement of Euler's method, Runga-Kutta methods, system of equation

Case Study: Mathematical model for computer sales Projection, Simulating transient current for Electrical circuit.

Reference Books:

1. Steven C Chapra, Numerical Methods For Engineers, McGraw-Hill.
2. S. S. Sastry, Introductory Methods of Numerical Analysis, Prentice-Hall India.
3. V. Rajaraman, Computer Oriented Numerical Methods, Prentice-Hall India.

Numerical Methods Lab with Python:

Hands-on experiments related to the course contents **ESC283**

Course Outcomes

1. Apply error analysis to complex numerical problems and solve the problems using bracketing and open methods.
2. Solve Real time system of linear equations and obtained most approximate solutions. Apply error analysis.
3. Learn the difference between Accuracy and Precision and types of errors.
4. Finding roots using Graphical method, Bisection method and False position method.
5. Solve a fixed point iteration method to obtained true roots.

6. Evaluate the True roots using Open method: Newton's Rapson method, secant method and multiple Newton Rapson method.
7. To understand the pitfalls of Gauss Elimination Method.

Articulation Matrix (as below)

PO/PSO➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1	✓	✓	✓					✓			✓	✓		
CO2		✓				✓				✓				
CO3	✓		✓		✓		✓		✓					
CO4		✓												
CO5	✓			✓										

BSC261	Mathematical Foundation for Engineering	2L: 0T: 0P	0 credits (Audit)

Course Objective:

1. To develop the sound conceptual understanding of Algebra, coordinate geometry, complex numbers , vectors, matrices, Calculus and Differential Equations.
2. To develop the foundation for engineering mathematics and other engineering courses.

Course Outcomes: At the end of the course student will be able to

CO1	analyze the structure of complex numbers, quadratic equations, vectors and matrices and their uses.
CO2	Find the standard and general equations of lines, circles, conic sections, and their properties.
CO3	Sketch the graphs of functions and can evaluate limit, continuity, derivatives, integrations.
CO4	Formulate and solve first order differential equations.

Articulation Matrix

PO → / CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1												
CO2												
CO3												
CO4												

Note: 1-Low, 2-Medium or 3- High.

Unit-1 Complex Numbers (05 hours)

Complex numbers as ordered pairs. Argand's diagram. Triangle inequality. Powers and roots of complex numbers, De Moivre's Theorem.

Unit-2 Algebra (05 hours)

Quadratic equations and express-ions. Permutations and Combinations. Binomial theorem for a positive integral index.

Unit-3 Coordinate Geometry (07 hours)

Coordinate Geometry: Locus. Straight lines. Equations of circle, parabola, ellipse and hyperbola in standard forms. Parametric representation.

Unit-4 Vectors and Matrices (08 hours)

Addition of vectors. Multiplication by a scalar. Scalar product, cross product and scalar triple product with geometrical applications. Matrices and Determinants: Algebra of matrices. Determinants and their properties. Inverse of a matrix. Cramer's rule.

Unit-5 Differential Calculus (10 hours)

Function. Inverse function. Elementary functions and their graphs. Limit. Continuity. Derivative and its geometrical significance. Differentiability. Rules of derivatives, Applications of Derivatives: Tangents and Normals, Increasing and decreasing functions. Maxima and Minima

Unit-6 Integral calculus (10 hours)

Integration as the inverse process of differentiation. Integration by parts and by substitution. Definite integral and its application to the determination of areas (simple cases). Solving first order differential equations:Exact differential equations and first order linear differential equations.

References:

1. Bernard and Child, Higher Algebra, Macmillan and Co. Pvt. Ltd, New York.
2. J.V. Uspensky, Theory of equations, macGraw Hill Publications.
3. S. L. Loney, The Elements of Coordinate Geometry, Macmilliams and Co., New York
4. G.B.Thomas, M.D.Weir, J. Hass, Thomas' calculus, 12th edition, Pearson Publications
5. H.Anton, C. Rorrers, Elementary Linear Algebra Applications version, 9th edition, Wiley publications.

MAC277	Indian Constitution	2L:0T:0P	0 credits

Course Objectives

1. To understand the basic foundation and the basic law for the governance of our nation, the history and the different types of Constitutions.
2. To understanding the importance and the different aspects of the Constitution. To know and understand the different rights enshrined in the Constitution and understand the rights and duties of the government.
3. To understand the basis and procedure of amendments.
4. To know the different aspects of the Union and the State Executive.
5. To know how our country was founded, who founded it, what are our rights are, what life was like, how life has changed, how the rights still apply today.

Content of course

1. Meaning of the constitution law and constitutionalism.Historical perspective of the Constitution of India. Salient features and characteristics of the Constitution of India.
2. Scheme of the fundamental rights. The scheme of the Fundamental Duties and its legal status.
3. The Directive Principles of State Policy –Its importance and implementation. Federal structure and distribution of legislative and financial powers between the Union and States.
4. Parliamentary Form of Government in India – The constitution powers and status of the President of India.
5. Amendment of the Constitutional Powers and Procedure The historical perspectives of the constitutional amendments in India.
6. Emergency Provisions: National Emergency, President Rule, Financial Emergency.
7. Local Self Government – Constitutional Scheme in India.
8. Scheme of the Fundamental Right to Equality. Scheme of the Fundamental Right to certain Freedom under Article

19 Scope of the Right to Life and Personal Liberty under Article 21.

Text/Reference books:

1. Introduction to the Constitution of India by Durga Das Basu (Students Edn.) Prentice-Hall EEE, 19th /20th Edition, 2001.
2. An Introduction to Constitution of India by M. V. Pylee, Vikas Publishing, 2002.

Course Outcomes

1. Student will be able to understand how India has come up with a Constitution which is the combination of the positive aspects of other Constitutions.
2. Student will be able to understand the interpretation of the Preamble.
3. Student will be able to understand the basics of governance of our nation.
4. It helps in understanding the different aspects covered under the different important Articles.
5. Student will be able to understand the basic law and its interpretation. Understand the important amendments which took place and their effects.
6. Student will be able to understand our Union and State Executive better.
7. Student will be able to that along with enjoying the rights one needs to fulfill one's duties.

Articulation Matrix (as below)

PO/PSO ➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1														
CO2														
CO3														
CO4														
CO5														

Semester - II

BSC275	Mathematics-IV: Statistical Methods and Complex Analysis	3L:0T:0P	3 credits

Course Objectives

1. To provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
2. To understand probability distributions and their properties
3. To learn the statistical parameters for different distributions, correlation and regression
4. To understand the method of curve fitting, testing of hypothesis, goodness of fit
5. Identify and construct complex-differentiable functions and use conformal mapping
6. Use the general Cauchy integral theorem and formula, Residue Theorem, and Express functions as infinite series or products.

Content of course

Unit 1: Analysis of Statistical Data (03 hours)

Frequency distribution; Frequency curve and histogram; Measure of central tendency and dispersion.

Unit 2: Random variables and Probability Distributions (08 hrs)

Basic concepts of probability and its properties; Conditional probability and independent events; Random variables, discrete and continuous random variables, Mean and variance of Binomial, Poisson and Normal distributions and applications.

Unit 3: Sampling Distributions and Interval of Estimation (08 hours)

Sampling Distributions: t distribution, Chi-square distribution, F-distribution,; Interval of estimation

Unit 4: Testing of Hypothesis (08 hours)

Relation between confidence interval and testing of hypothesis; testing of hypothesis, classification of hypothesis tests; large sample tests, small sampe tests.

Unit 5: Complex Variable- Differentiation (08 hours)

Functions of complex variables, Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, elementary analytic functions; Conformal mappings.

Unit 6: Complex Variable – Integration (10 hours)

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Residue theorem and evaluation of real integrals.

References:

1. E. Kreyszig, ***Advanced Engineering Mathematics***, Eighth Edition, John Wiley and Sons, 2015.
2. V. K. Rohatgi and A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, 2nd Edition.
3. D. C. Montgomery and G.C. Runger, "Applied Statistics and Probability for Engineers", 5th edition, John Wiley & Sons, (2009).
4. P. S. Mann, Introductory Statistics, Wiley Publications, 7th edition (2013).
5. 2. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.

Course Outcomes

After successful completion of this course student will be able to:

1. To develop techniques of data interpretation.
2. Develop problem solving techniques needed to accurately calculate probabilities and describe the properties of discrete and continuous distribution functions.
3. Use statistical tests in testing hypotheses on data.
4. Compute covariances, and correlations, Apply the tests of goodness of fit.
5. Determine whether a given function is analytic and apply analyticity on harmonic functions and conjugates of harmonic functions.
6. Transform a region to another region using conformal mapping.
7. To evaluate contour integrals using Cauchy's integral theorem and formula, and
8. Represent functions as Taylor, power and Laurent series, classify singularities and poles, find residues and evaluate complex integrals using the residue theorem.

Articulation Matrix (as below)

PO/PSO⇒ ⇓ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1														
CO2														
CO3														
CO4														
CO5														

PCC-EC204	Communication Engineering Principles	3L:0T:2P	4 credits

Course Objectives

To acquaint students with:

1. Basic communication systems.
2. Probability and theory of random signals with operations on random variables.
3. Basic modulation and demodulation techniques.
4. Radio transmission and reception mechanism.
5. Basics of modern communication.
6. Motivate students to learn advanced communication technologies.

Content of course

Introduction to Communications Systems: Elements of a communication system, The Channel, Frequency bands, Bandwidth, Noise in communication system, Signal to noise ratio, Noise Figure, Fundamentals of transmission lines,
Characteristic impedance, basics of antenna design, Applications of communication system.

Random signals: Probability, Random variable, Discrete, continuous and mixed random variables, Operations on one
Random variable, Multiple Random Variables, Operations on multiple random variables, transformations on random
variables and properties, Expectations, moments, Central limit theorem.

Distribution and Density Functions: conditional, marginal, joint, Gaussian distribution and density, Sampling and estimation of mean, variance and moments, weak law of large numbers and strong law of large numbers.

Analog communication: Amplitude Modulation, types of amplitude modulation, modulation index, power relation in AM, Current relation in AM, AM transmitter, Angle modulation and its types, Relationship between FM and PM.

Radio Transmission: AM radio transmitter and receiver, Tuned radio frequency and super heterodyne radio receiver, AM detector, FM radio receiver and its detection techniques.

Text/Reference Books:

Kennedy and Davis, Electronic communication Systems, Fourth Edition, TMH Publications, 2004
Peton Z and Peebles Jr, Probability, Random Variables and Random Signal Principles, TMH Publications, 2002
Anokh Singh and A.K. Chhabra, Principles of Communication Engineering, S. Chand & Company Ltd Publications, 2004
A. Bruce Carlson, et al : Communication systems, 4/e, McGraw Hill, 2001
H. Taub, D. Schilling, Principles of Communication systems, TMH, 2nd Ed.
Simon Haykin, Communication systems, 4/e. John Wiley, 2001
D. Roddy and J. Coolen, Electronic Communication, PHI Publication.

Communication Engineering Principles Lab

Hands-on experiments related to the course contents PCC-EC204

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
2. Analyze the behavior of a communication system in presence of noise
3. Investigate pulsed modulation system and analyze their system performance
4. Analyze different digital modulation schemes and can compute the bit error performance

Articulation Matrix (as below)

PO/PSO ➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1	✓							✓				✓		
CO2	✓						✓							
CO3		✓							✓					
CO4			✓								✓			
CO5		✓				✓								

PCC-EC205	Analog Circuits and Design	3L:0T:2P	4 credits

Course Objectives

1. To understand the concepts, working principles and key applications of linear integrated circuits.
2. To perform analysis of circuits based on linear integrated circuits.
3. To design circuits and systems for particular applications using linear integrated circuits.

Content of course

Operational Amplifier: OpAmp (741), specifications, packaging, characteristics, ac and dc parameters and their measurements, noise and frequency compensation.

Linear OpAmp Circuits: Inverting and non-inverting amplifiers, summing amplifier, differential amplifier, instrumentation amplifier and its applications, voltage to current converters and current to voltage converters, low voltage ac and dc voltmeter.

Nonlinear OpAmp Circuits: Differentiator, integrator, comparator and its characteristics, Schmitt trigger, window detector, peak detector, precision rectifier, log and antilog amplifier.

Voltage Regulators: Design of series voltage regulator using discrete components, protection circuits and pre-regulator, design of fixed voltage regulators (IC 78xx and 79xx), adjustable regulators (LM 317, 337), precision voltage regulators (IC 723), design of switching regulators (IC 78s40).

Amplifier Design: Design of class A, class AB, and class C amplifiers, performance parameters, monolithic power amplifiers LM 380 and TBA 810.

Waveform Generators: Square wave, triangular wave and sawtooth wave generator, phase shift and Wein bridge oscillators and its design, function Generator using ICL 8038.

Specialized ICs and Their Applications:Design of IC 555 and its applications, PLL IC 565 and its applications, design of voltmeter using 7106/07.

Reference Books:

Ramakant Gaikwad, OPAMPS and Linear Integrated Circuits, PHI/Pearson Education.
S.N. Talbar and T.R. Sontakke, Electronic Circuit Design, SadhuSudha Prakashan, Nanded
K.R. Botkar, Integrated Circuits, Khanna Publishers, Delhi.
B.S. Sonde, Design using Integrated Circuits, Wiley Eastern.
Sedra and Smith, Microelectronic Circuits, Sixth Edition

Analog Circuits and Design Lab

Hands-on experiments related to the course contents PCC-EC205

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Understand the fundamentals and areas of applications for the integrated circuits.
2. Analyze important types of integrated circuits
3. Demonstrate the ability to design practical circuits that perform the desired operations
4. Understand the functioning of OP-AMP and design OP-AMP based circuits
5. Understand the differences between theoretical, practical & simulated results in integrated circuits.
6. Select the appropriate integrated circuit modules to build a given application.

Articulation Matrix (as below)

PO/PSO ➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1	✓	✓		✓				✓		✓		✓		
CO2														
CO3							✓							
CO4		✓	✓								✓			
CO5					✓									

PCC-EC206	Microcontrollers and Applications	3L:0T:2P	4 credits

Course Objectives

Students will try to learn:

1. fundamentals of microprocessor and Microcontrollers, 8051 Architecture and Instruction set,
2. Assembly Language Programming, o Memory and I/O Interfacing,
3. Interrupts, Timers and counters,
4. Serial Communication and Interfacing techniques of 8051 Microcontroller.
5. Motivate students to use modern microcontrollers for projects.

Content of course

Introduction microprocessor and microcontroller: Review of 8085 microprocessor, What is Microcontroller? Overview of the 8051 family, Microcontrollers survey: 4/8/16/32-bit Microcontrollers

The 8051 Architecture: Features, Architecture of 8051, Pin Configuration, Oscillator and clock, ALU, Program counter, data pointer registers, stack and stack pointer, special function registers, memory organization, program memory, data memory, Input/Output Ports, External memory, Counter and Timer, Serial data Input / output, Interrupts

8051 Assembly Language Programming: 8051 Assembly programming, Assembling and running an 8051 program, 8051 data types and directives, 8051 flag bits and the PSW register, 8051 register banks and stack. Addressing Modes, 8051 Instructions: Data Transfer Instructions, Arithmetic and Logic Instructions, Branch Instructions, Subroutine Call and RET Instructions, Bit manipulation Instructions, I/O Port Programming, Assembly programming examples, Software development Tools for 8051: Assembler, Simulator, Compiler & Debugger,etc.

Memory and I/O Device interfacing with 8051:

Structure and Operation, Port Programming, Interfacing of Data memory and program memory, Port interfacing of switches and LEDs with ports and it's programming.

8051 Interrupts: Basic of Interrupts, 8051 Interrupt structure, Interrupt Programming, Programing External hardware interrupts

8051 Timers and Counters: Timer/Counter organization, operation modes, programming in 8051 and Applications

8051 Serial Communication: Basics of Serial Communication, Synchronous and Asynchronous Communication, RS-232 protocol, MAX232, SFR and Modes of Serial Communication, Programming

Study of I/O Peripherals: Interfacing of Relays, Stepper Motor, LCD display, 8 bit ADC and DAC ICs and applications, Interfacing and Programming the PPI 8255 with 8051.

Applications of Microcontroller 8051

Reference Books :

Muhammad Ali Mazidi and Janice Gillispe, The 8051 Microcontroller and embedded systems, Pearson Education Asia, Indian reprint 2002.

1. V Udayshankara, M S Mallikarjunaswamy, “801 Microcontroller”, Tata McGraw-Hill, 2009
2. Kenneth J. Ayala, The 8051 Micro-controller– Architecture, Programming & Applications, Third Edition, Cengage Learning, India, 2007.

3. Ajay V Deshmukh, Microcontrollers (Theory and Applications) The McGraw- Hill Companies, 2005.
4. The 8051 Microcontroller & Embedded Systems Using Assembly and C, 1st Edition, Cengage Learning, India, 2010.

Microcontrollers and Applications Lab

Hands-on experiments related to the course contents PCC-EC206

Course Outcomes

At the end of the course the student is expected to understand-

1. Microcontroller 8051 architecture, instruction set
2. Memory and I/O Interfacing
3. Interrupts, counters and timers
4. Serial communication
5. I/O peripherals
6. Applications using 8051

Articulation Matrix (as below)

PO/PSO➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1	✓					✓			✓					
CO2		✓												
CO3					✓									
CO4			✓											
CO5							✓							

ESC284	Data Structures	3L:0T:2P	4 credits

Course Objectives

1. Make the students familiar with basic concepts and techniques of object oriented programming in C++.
2. Develop an ability to write programs in C++ for problem solving.
3. Develop types of inheritance like single, multiple, multilevel hierarchical and hybrid inheritance.
4. To understand the behavior of data structures such as stacks, queues, trees, hash tables, search trees, Graphs and their representations.
5. To write programs in C++ to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables, search trees.

Content of course

Object Oriented Programming Languages: Introduction and overview of C++
Data Structures Basics: Structure and Problem Solving, Data structures, Data structure Operations.
Linked List: Introduction, Linked lists, Representation of linked lists in Memory, Traversing a linked list, Searching a linked list, Memory allocation and Garbage collection, insertion into linked list, Deletion from a linked list, Types of linked list.
Stack and Queue: Introduction, Array Representation of Stack, Linked List Representation of stack, Application of stack, Queue, Array Representation of Queue, Linked List Representation of Queue
Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Sequential and Other Representations of Trees, Tree Traversal.
Graphs: Matrix Representation of Graphs, List Structures, Other Representations of Graphs, Breadth First Search, Depth First Search, Spanning Trees.
Directed Graphs Types of Directed Graphs; Binary Relation As a Digraph; Euler's Digraphs; Matrix Representation of Digraphs.
Searching and Sorting Techniques, Sorting Techniques: Bubble sort, Merge sort, Selection sort', Heap sort, Insertion Sort. Searching Techniques: Sequential Searching, Binary Searching, Search Trees.
Algorithmic Design Techniques: Brute force and greedy algorithms, backtracking algorithms, divide and conquer, dynamic programming, randomized algorithms.
###Course Outcomes:
Learn how to use data structure concepts for realistic problems.
Ability to identify appropriate data structure for solving computing problems in respective language.
Ability to solve problems independently and think critically.###############
Reference Books:

1. R. Preiss, Data Structures and Algorithms with Object Oriented Design Patterns in C++, John Wiely and Sons.
2. Sartaj Sahni, Data structures, Algorithms, and Applications in C++, McGraw Hill.
3. E Balagurusamy, Object Oriented Programming With C++, Tata Mcgraw Hill.
4. Jean-Paul Tremblay, Paul G. Sorenson, An Introduction to Data Structures With Applications, Mcgraw Hill Computer Science Series

Data Structures Lab with C++

Hands-on experiments related to the course contents ESC284

Course Outcomes

1. Describe the principles of object oriented programming.
2. Apply the concepts of data encapsulation, inheritance in C++.
3. Understand basic program constructs in C++.

4. Apply the concepts of classes, methods and inheritance to write C++ programs.
5. Use arrays, vectors and strings concepts and interfaces to write C++ programs.
6. Describe and use the concepts in OOPs to develop user friendly program.

Articulation Matrix (as below)

PO/PSO➡ ⇩ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1	✓			✓				✓		✓				
CO2					✓							✓		
CO3	✓					✓								
CO4		✓					✓							
CO5			✓								✓			

HMC278	Human Values and Professional Ethics	2L:0T:0P	2 credits

Course Objectives

1. To create an awareness on Professional Ethics and Human Values.
2. To help students understand the Harmony for life.
3. To understand co-existence.
4. To study the moral issues and decisions confronting individuals and organizations in profession.

Content of course

1. **Course Introduction**: Need, basic guidelines, content and process for value education, Moral values, Social, Environmental, Economic values, Purusharth, Duty, Justice, Equality.
A look at basic aspirations: self exploration, happiness and prosperity, Fulfillment of human aspirations.
2. Understanding the Harmony: Thoughtful human being harmony, sentient, attitude and its importance in relationship, significance of restraint and health *(Yama and Niyama),* Egoism, Altruism, Universalism (idea of Sarvodaya and Vasudevkutumbakam), The problem of hierarchy of values and their choice (View of Pt Madan Mohan Malviya and Mahatma Gandhi), human goal settings and life management techniques.
3. Understanding professional Ethics: Harmony at various levels and understanding professional ethics, creating environmentally aware engineers, humanistic universal education, humanistic universal education, natural acceptance of human values, ethical human conduct.
4. Competence of professional Ethics Management models for present technologies, strategies for integrating humans in family and at all levels of existence, relevance of the above strategies in becoming responsible engineers, technologists and managers.
5. Motivation: Contribution of ancestors in science and technology development to raise self esteem in Indian context.

Text / Reference Books:

1. R. R. Gaur, R. Sangal, G. P. Bagaria, A Foundation Course in Value Education, 2009.
2. A Nagraj, 1998, "Jeevan Vidya ek Parichay", Divya Path Sansthan, Amarkantak.
3. Sussan George, "How the Other Half Dies", Penguin Press, 1976, Reprinted 1986, 1991
4. PL Dhar, RR Gaur, "Science and Humanism", Commonwealth Purblishers,1990.
5. A.N. Tripathy, "Human Values", New Age International Publishers, 2003.
6. Subhas Palekar, "How to practice Natural Farming", Pracheen(Vaidik) Krishi Tantra Shodh, Amravati, 2000.
7. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, "Limits to Growth – Club of Rome's report", Universe Books, 1972.
8. E G Seebauer & Robert L. Berry, "Fundamentals of Ethics for Scientists & Engineers", Oxford University Press, 2000.
9. M Govindrajran, S Natrajan & V.S. Senthil Kumar, "Engineering Ethics (including Human Values)", Eastern Economy Edition, Prentice Hall of India Ltd.
10. Subroto Bagchi, "The Professional", Penguin Books India.
11. B P Banerjee, "Foundations of Ethics and Management", Excel Books, 2005.
12. B L Bajpai, "Indian Ethos and Modern Management", New Royal Book Co., Lucknow, 2004, Reprinted 2008.
13. Dr. Nityanand Mishra Niti Shastra ,Motilal Banarasidas 2005
14. Dr. Avdesh Pradhan Mahatma ke Vichar , BHU Varanasi 2007

Course Outcomes

At the end of the course, students should:

1. Understand the core human values that shape the ethical behavior of a person.
2. Understand how values act as an anchor of actions for life.
3. Learn the need of Human values and Professional ethics in life.
4. Understand Harmony at Four levels of life.
5. Learn the moral issues and problems in profession and find the solution to those problems.
6. Understand the core human values that shape the ethical behavior of a person.

Articulation Matrix (as below)

PO/PSO➡ ⬇ CO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO 1			1			2		3						
CO2								3						
CO3								3				3		
CO4						2		3						
CO5			1			2		3	2			3		
